STS 119 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-119) and International Space Station (15A)

The toxicological assessments of 2 grab sample canisters (GSCs) from the Shuttle are reported in Table 1. Analytical methods have not changed from earlier reports. The recoveries of the 3 surrogates (^{13}C-acetone, fluorobenzene, and chlorobenzene) from the 2 GSCs averaged 106, 106, and 101 %, respectively. Based on the end-of-mission sample, the Shuttle atmosphere was acceptable for human respiration.

Table 1. Analytical Summary of Shuttle Samples

Sample Location	Date of Sample	NMVOCs [a] (mg/m^3)	Freon 218 (mg/m^3)	T Value[b] (units)	Alcohols (mg/m^3)	Formaldehyde ($\mu g/m^3$)
Preflight	3/15/09	1.0	0	0.47	0.3	--
Middeck (end mission)	3/28/09	2.6	150	0.26	1.6	--

[a] Non-methane volatile organic hydrocarbons, excluding Freon 218
[b] Calculated excluding CO_2, formaldehyde, and siloxanes.

The toxicological assessment of 12 GSCs and 4 pairs of formaldehyde badges from the ISS is shown in Table 2. The recoveries of the 3 standards (as listed above) from the GSCs averaged 87, 95 and 94%, respectively. However, the surrogate recoveries for the samples taken on 3/10/09 were below the accepted range, probably due to a low dosing into the canisters. The results have been reported without correction for low surrogate recoveries. Two formaldehyde-badge lab controls averaged 95% recovery.

Table 2. Analytical Summary of ISS Results

Module/Sample	Approx. Date	NMVOCs[a] (mg/m^3)	Freon 218 (mg/m^3)	T Value[b] (units)	Alcohols (mg/m^3)	Formaldehyde ($\mu g/m^3$)
Lab	12/09/08	9	850	0.37	8	--
Col	12/09/08	6	1000	0.30	4	--
SM	12/09/08	10	1100	0.67	7	--
SM	1/13/09	10	920	0.40	7	--
Lab	1/13/09	9	670	0.34	7	--
JEM	1/13/09	10	850	0.39	7	--
Lab	2/10/09	7	440	2.55[c]	4	27
Col	2/10/09	6	530	0.34	4	--
SM	2/10/09	6	340	1.01	3	24
JEM	3/10/09	6	580	1.53[c]	3	--
Lab	3/10/09	8	370	1.20[c]	4	30
SM	3/10/09	6	360	0.75	4	31
Guideline		*<25*	*none*	*<1.0*	*<5*	*<120*

[a] Non-methane volatile organic hydrocarbons, excluding Freon 218
[b] Calculated excluding CO_2, formaldehyde, and siloxanes.
[c] High T values are due to traces of propenal, an irritant

The Freon 218 values suggest a large leak some time before 12/09/08 and very slow removal thereafter. The T-values are generally within acceptable range; however, a few values were elevated due primarily to trace amounts of propenal, a potent mucosal

irritant. The crew has not reported any eye or upper airway irritation and the elevated T-values are typically confined to one module during any given sampling session. In addition, the high values are transient as best one can discern with samples spaced a month apart.

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Enclosures
Table 1A: Analytical concentrations of compounds found in the STS-119 GSCs
Table 1B: Analytical concentrations of compounds found in 15A GSCs
Table 2A: T-values of the compounds in table 1A
Table 2B: T-values of the compounds in table 1B